

# LANDSLIDES

## *Purpose*

*The purpose of these two experiments is to determine which of the following factors is most important in determining whether a landslide occurs: angle of slip plane, weight of overlying strata, roughness of slip plane surface, water on slip surface or pore pressure.*

*Activity I uses a "smooth" plane whereas activity II uses a plane with varying degrees of roughness.*

## *Instructions*

*Each measurement should be made several times and an average angle calculated.*

### *Activity Ia To test the effect of weight*

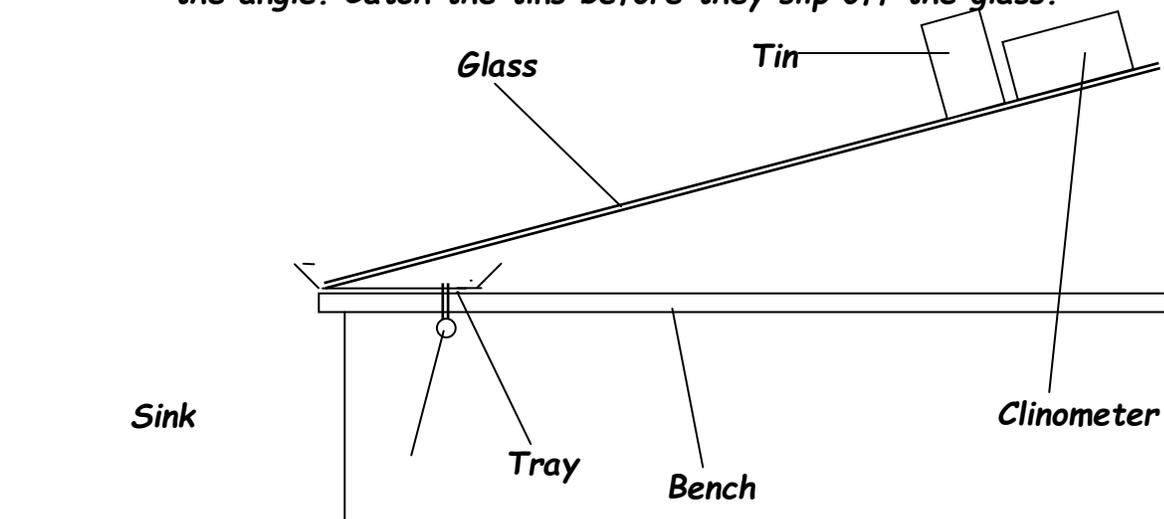
- 1. Place the two tins A with pebbles and B without pebbles on the dry glass. Hold a clinometer on the top edge of the glass.*
- 2. Lift the end of the glass very slowly and record the angle at which each tin slips. Catch the tins before they slip off the glass.*

### *Activity Ib To test the effect of lubrication*

- 3. Repeat with the tins on the second sheet of glass and wet the surface.*

### *Activity Ic To test the effect of pore pressure*

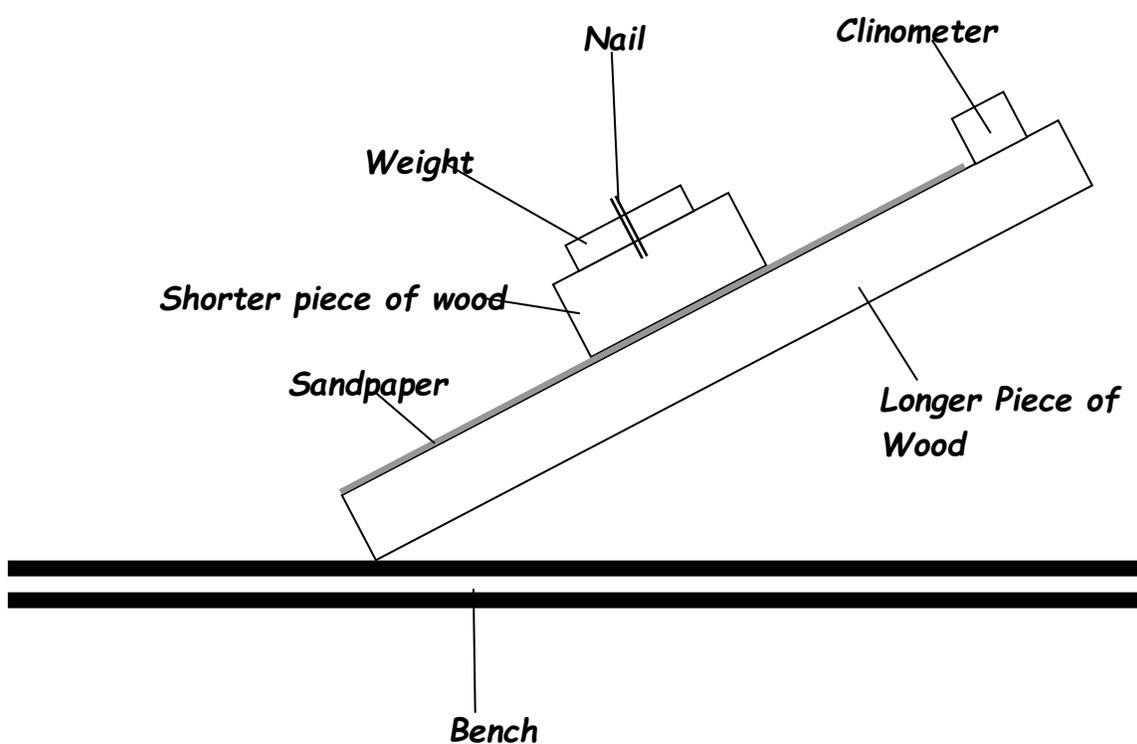
- 4. Place tins C (with no holes) and D (with holes in bottom) at the top of the wet glass and fill C and then D with water. Put the caps on.*
- 5. Again lift the end of the glass very slowly until each slips and record the angle. Catch the tins before they slip off the glass.*



## Clamp

**Activity IIa To test the effect of weight**

1. Place the clinometer on one end of the larger piece of wood. Place the smaller piece of wood on top of the larger one so that the pieces of sandpaper are touching.



2. Raise the one end slowly until the block slips and then record the angle.
3. Place the 500g weight over the nail on the upper block and repeat instruction 2.
4. Repeat with more weights

**Activity IIb to test the effect of surface roughness**

5. Repeat with blocks with different grades of sandpaper

## Teacher's Section

### Requirements

#### Activity I

2 sheets of 6mm glass 50cm by 30cm supported on a board. Round edges of glass slightly with carborundum paper. Label one sheet of glass "dry" and the other "wet". The latter must overhang a sink or suitable tray.

Clinometer (Maxiclin from Geosupplies works well)

4 tins 17cm high and 10cm diameter (large dog food tins are ideal), two with lids to reduce water spills.

Tin A half full of pebbles, Tin B empty, Tin C half full of sand (between 1 and 2 mm), Tin D as tin C but with 20 holes less than 1mm punched into bottom (These can be made with a nail).

Sink.

#### Activity II

3.6m of planed timber 100mm by 50mm

1m of each of the following grades of sandpaper: 60, 80, 120

12 drawing pins

4 15cm nails

Clinometer

Weights 500g 100g and 200g

*Making the equipment for activity II (45 minutes)*

*Cut the timber into 4 pieces 30cm long and 4 pieces 60cm long.*

*Cut each piece of sandpaper into lengths of 35cm and 65cm.*

*Attach the sandpaper to the blocks using the drawing pins.*

*Drill a 25mm deep hole in the centre of the 30cm block and place the 6 inch nail into it.*

### Notes

*The tins may slip a little before they start slipping continuously.*

*Clinometers may need shaking a little because sometimes they get stuck.*

*A more accurate angle can be obtained using a large demonstration protractor. Students should raise the end of the glass and wood slowly, the sudden movement of the tin or upper wooden block may alter the angle they were holding it at.*

*You can also try varying the amount of water in the tin with holes. An increase in the volume of water increases the pore pressure and thus lowers the angle of slip*

**Time**

**Activity I 20 minutes, Activity II 40 minutes**

**Results**

**The angle of the slip plane and the pore pressure have a big effect. Changing the weight has no effect on the angle of slip because if the weight is increased so is the friction. Increasing bed roughness increases the angle of slip when sandpaper is used but the plane wood often has a higher angle than the sandpaper, Lubricating the surface should lower the angle but in this experiment capillary attraction sometimes causes the lubricated tin to slide at a higher angle than the dry tin.**

**Cost**

**Glass 6mm thick £5 per sheet**



***Landslide using glass sheet***



***Landslide using wooden blocks***